

**POWER DISTRIBUTION BLOCK ASSEMBLY**

**Disclosure**

5 This invention relates generally as indicated to a power distribution block assembly and more particularly to a terminal distribution block assembly and method which is finger-safe when energized, whether empty, or at full capacity.

**Background of the Invention**

10 In the distribution of electric power, distribution blocks are often employed. These assemblies have widely been used for distributing incoming electrical power to a number of distinct circuits. Applications may vary widely such as power distribution to houses from a common transformer, or in electrical distribution panel boards where the blocks may be mounted on a common rail for distribution in mono-polar or multi-polar applications.

15 Typically the block includes a connection for a larger conductor cable or bus and a plurality of tap connections for smaller conductors. The bare ends of the conductors are inserted in socket ports or holes and held in place typically by a clamp or binding screw threaded in a hole perpendicular to the socket receiving the conductor.

One of the problems with these types of distribution blocks is that many of the tap connections are added at a later time after the system is in operation and the block energized. To make the connection safely the system may require to be shut down, and this in turn may create a raft of problems, particularly if the power is shut down for any length of time.

In order to protect the block from incidental contact many are enclosed in insulating enclosures or cases which protect the block from direct contact. To make a connection the case may be provided with large windows or ports or even hinged covers which may be opened for access, or the cases may be removed entirely, all of which permits finger contact with the block by the installer.

The use of insulating cases makes the proper installation of primary and tap connections more problematic. In a connection using a typical blind socket port or hole the installer simply inserts the bare or stripped end of the conductor into the socket until resistance is felt and then tightens the binding screw. It may not be determined that an improper connection was made until the power is turned on again or until the connection fails because the bare end of the conductor wasn't properly positioned with respect to the binding screw. The conductor may have hung-up on an obstruction which was not the blind end of the hole or port. If the conductor is inserted too far, the projecting end may interfere with or obstruct something else, and the binding screw may be tightened on insulation. Moreover non-uniform projecting conductors create a mess, particularly when all the taps are used making service and inspection difficult.

It would accordingly be advantageous for the installer to be able to have both the abutment afforded by the blind end of the port and a visual check to see that the conductor is properly inserted or placed before the

binding screw is tightened. In this manner, ensured uniform connections can be made for each of the taps, with the ends of the conductors projecting beyond the screws a uniform distance, and not too far or not far enough.

5           It would also of course be desirable that these uniform tap connections could all be made without turning off the power or opening an insulating case. It would therefore be desirable to be able to make such uniform connections having both the visual and physical abutment check without finger contact with the block and without opening the case. A  
10       power distribution block with such connections which is finger-safe once the incoming line is installed is highly desirable.

### **Summary of the Invention**

15           The terminal block assembly of this invention provides a finger safe method of distributing power while at the same time enabling the installer to make uniform and correct connections to a multiplicity of taps or ports. Each connection includes an abutment or seat physically to engage the end of the conductor and in addition the construction of the block and its insulating case provides the installer with visual access to the tip of the conductor in its proper seated position before the conductor is secured to  
20       the block.

          In order to provide such visual access the walls partially blocking the seating end of each conductor socket are scalloped or provided with an inverted conical section which enables the tip of each conductor to be seen from the top of the block. To facilitate this visual access the entire top of  
25       the insulating case is made from a transparent material.

          The cover is provided with respective holes each accommodating an insulated fastener driver so that the clamp screws may be manipulated or tightened from the exterior of the case.



### **Detailed Description of the Preferred Embodiment**

Referring initially to Figure 1 there is illustrated a power distribution block assembly in accordance with the present invention shown generally at 20. The metal conducting block is shown at 21 while the block is surrounded by insulating case 22 having a hinged top cover 23 shown in the open position.

The metal terminal block 21 shown in detail in Figures 2 through 6 is made from conductive metal such as an aluminum alloy and can be extruded and machined. After machining the blocks may then be tin plated to a thickness of approximately 0.05 mm.

The plastic insulation case 22 is preferably made from a plastic such as nylon 6. The cover, however, is made of a transparent plastic material such as polycarbonate such as sold by General Electric Company of Schenectady, New York under its trademark LEXAN® 940A. The cover may be tinted a color such as blue, but is nonetheless fully transparent providing visual access to the interior of the case and block when the cover or lid is closed.

As seen in Figure 1 the case 22 comprises side walls 26 and 27, end walls 28 and 29, and a bottom wall 30 somewhat obscured. The cover 23 may be hinged as indicated at 33 and 34 to the end wall 28 and the cover or lid may be provided with an over-center snap to keep it in the open position shown. The tip of the cover is provided with a snap tang indicated at 36 which seats in snap recess 37 in the top of wall 29. The underside of the cover or lid is provided with two projecting ribs seen at 38 and 39 which telescope inside the top edge of the case 22 blocking access to the interior of the case when the lid or cover is closed. The insulating case is also provided with certain projections from the bottom wall 30 indicated at 42 and 43 to facilitate the mounting of the power distribution block assembly on an electric panel or din-rail. While each individual assembly

is a single-pole or mono-pole block, such assemblies may be ganged together by means of the male and female dovetails shown at the sides for convenient distribution in multi-pole systems.

Referring now additionally to Figures 2 through 6 it will be seen that the conductive metal terminal block 21 may be formed from an extrusion and then machined and includes a large section at one end shown generally at 45 which includes a large socket 46 in wall 47. Extending normal to the socket is a threaded hole 48 in the top wall 49 of the enlarged end 45. The threaded or tapped hole 48 accommodates large recessed head clamp screw 52 seen in Figure 1.

The large socket 46 extends through the interior wall 54 of the enlarged end and partially into the reduced height portion 56 of the block 21. This extension of the socket beyond the wall 54 is seen at 58 in Figure 3.

Situated in the reduced height portion 56 of the block are three tap sockets 60 which open generally to the right hand side of the block as seen in Figures 2 through 6. Each of the tap sockets is provided with a transverse threaded opening in the top seen at 62, 63, and 64 for accommodating the clamp screws indicated at 66 in Figure 1.

Projecting from the reduced height portion 56 of the block is another offset tier of tap ports or sockets shown generally at 70 and projecting from the intermediate tier 70 is a further offset tier 72. The intermediate tier includes four side-by-side sockets or ports for tap connections indicated at 74 while the top tier includes four side-by-side tap connections indicated by the sockets 75. Again, each respective socket or port is provided with a transversely extending threaded hole as seen at 76 for the intermediate tier 70 and 77 for the top tier 72. These tapped holes in the top two tiers accommodate the clamp screws seen at 78 in Figure 1. It is noted that the

socket in a single tier may be the same size or they may vary in size as in the bottom tier.

Referring now more particularly to Figures 2 and 5 it will be seen that the sockets 75 in the top tier 72 are partially blocked by the adjoining tier 70 while the sockets 74 in the intermediate tier are partially blocked by the portion of the block of reduced height indicated at 56.

The abutment wall at the end of each of the sockets seen at 74 and 75 is slightly beyond the interior wall of the tier and each abutment end of the socket at such wall is provided with an inverted conic relief or scallop as indicated at 80 for the top tier sockets and 81 for the intermediate tier sockets. The two outside sockets in the lower most tier are partially blocked by the wall 83 which also includes the inverted conic projection or scallop 84 opening into sight windows 85 and 86. These sight windows are formed in the reduced height portion of the block. The center socket in the bottom tier is also provided with an abutment wall partially blocking the interior of the socket and a similar scalloped or inverted conic projection opening into the large socket for the main conductor shown at 46 and 56.

In this manner each of the tap sockets is provided with an internal abutment wall and also a sight window enabling the tip of the conductor inserted into the tap port or socket to be seen from the top of the assembly through the transparent cover 23. The scallops or projections into the abutment walls of the various tap sockets may be formed by an angled drill point and need not be inverted circular conical sections, but may be other shapes as well. In each of the sockets or tap ports, the abutment wall may extend to approximately half the height of the socket opening or diameter and the angle of the conical section may vary at its center from approximately 15 to approximately 40° and, preferably, about 30° from vertical.

Referring now to Figure 6 there is illustrated insulated conductors shown at 90, 91, and 92 inserted in the respective sockets 75, 74, and 60. The tips of the conductors with the insulation removed is seen at 93, 94, and 95 and such tips engage the abutment end of each socket and in such physical contact with the abutment end the tip of the respective bared conductor indicated at 98, 99, and 100 is visible from the top of the assembly through the transparent cover 23. Figure 6 illustrates the cover with access ports seen at 102, 103 and 104 which are aligned with the clamp screws of the various ports or sockets. As seen more clearly in Figure 1 the cover or lid is provided with a total of eleven (11) ports, one for each of the various tap connections provided by the block 21.

Also as seen in Figure 6, the case 22 includes alignment galleries seen at 107, 108, and 109 which assist the installer in insertion of the bared end of the conductor into the socket and also protect against finger insertion into the case.

Accordingly, once the main conductor is inserted and the fastener 52 tightened to activate the block and the cover or lid is closed, the assembly is then finger-safe for installing, one, more, or all of the various tap connections available.

Even though the insulated case is closed, as the installer makes the connection, the installer has the benefit of both the physical abutment or engagement of the tip of the conductor against the abutment wall and the visual access to the tip of the conductor through the transparent lid or top. In this manner all of the tap connections will be both uniform and electrically correct, each with the proper uniform extent of the conductor extending beneath and beyond the clamp screw. The operator then simple inserts an insulated tool through the respective access openings 102, 103, or 104 to tighten the clamp screw on the properly positioned conductor bare end.



Although not illustrated, it will be appreciated that once the tap conductors are stripped to the specified length they may be installed first in a ferrule placed over the stripped end portion of the conductor. The conductor or ferrule will then proceed to the abutment or bottom of the tap hole that is partially visually exposed and visible through the transparent cover. This visual indication of the conductor placement ensures that the installer has both the physical abutment available as well as a visual check to make sure the conductor is properly in place before the fastener is secured.

Referring now to the embodiment of Figure 7 there is illustrated a slightly smaller version of the terminal block assembly of the present invention. The embodiment shown generally at 120 includes an insulated case 121 with a transparent cover 122. The block within the case isn't shown but the case is provided with alignment galleries shown at 123 and 124 to enable the bared conductor ends with or without ferrules to be inserted into the tap receiving sockets. The clamp screw of each tap receiving socket is provided with an access port in the cover or lid as seen at 126 or 127.

It is noted that the cover of the embodiment of Figure 7 is provided with a somewhat larger hole 130 which provides access to the clamp screw for the main conductor. The cover is also provided with a somewhat smaller hole 131 providing access to a clamp screw for another tap. In the smaller version illustrated, the transparent cover 122 for the case may be fixed with the somewhat larger access opening 130 provided for the incoming line. This is in contrast to the larger embodiment of Figure 1 where the large fastener 52 for the incoming line has no access opening in the hinged cover.

Whether the larger or smaller version of the present invention, both are provided with transparent covers or lids which provide visual access through the sight windows to the tips of the conductors with or without ferrules inserted in the various tap ports or sockets against the abutment walls forming the inner ends of such sockets. The present invention provides a large capacity for power distribution but at a low cost and in a finger-safe manner enabling the installer to make uniform proper connections avoiding over or under insertion of the tap connections.

Although the invention has been shown and described with respect to certain preferred embodiments, it is obvious that equivalent alterations and modifications will occur to others skilled in the art upon the reading and understanding of this specification. The present invention includes all such equivalent alterations and modifications, and is limited only by the scope of the claims.